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ABSTRACT

A study compared a text annotation method to underlining to ascertain whether students were more likely to learn and remember material they had read using one strategy or the other. Subjects were 67 students in 4 classes of a 7-week study skills course. One group was trained in text annotation, one in underlining, and two control groups were given no training. Following pretests, all groups were given two text selections to read on two separate occasions, one selection taken from a history text and one from a science text. All groups were given multiple choice tests immediately following the reading and wrote delayed recalls of the information 3 weeks later. Three groups wrote immediate recalls of the information. Results indicated no significant differences between the two experimental groups on the immediate recalls, while one of the control groups scored higher in several areas. Scores for the delayed retellings indicated no significant differences between the two experimental groups except in the area of text comprehension for science. All three groups writing recalls scored significantly higher than the group which did not write recalls, indicating a strong connection between writing about reading and retention of information. Findings suggest that strategic underlining is an effective study technique for short term learning; that the annotation method, at least for science studies, is more effective for retention; and that a reading/writing connection may be a useful learning strategy when retention is a specific goal. (Appendixes contain the Mitchell-Irwin Retelling Profile used to score recalls, and several tables of data.) (SR)

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TEXT ANNOTATION AND UNDERLINING AS METACOGNITIVE STRATEGIES TO IMPROVE COMPREHENSION AND RETENTION OF EXPOSITORY TEXT

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TEXT ANNOTATION AND UNDERLINING AS METACOGNITIVE STRATEGIES FOR IMPROVING COMPREHENSION AND RETENTION OF EXPOSITORY TEXT

The present study began as an outgrowth of research conducted at the University of Georgia by Nist and Simpson (1988). In an effort to improve the comprehension and retention of text book material read by students enrolled in study skills courses at the University of Arizona, instructors in the courses had been teaching the text annotation method developed by Nist and Simpson. The present study was designed to compare the annotation method to underlining to ascertain whether students who read and annotated material were more likely to learn and remember it than were students who read and underlined the same material.

The literature on both techniques offers mixed results as to their usefulness. Two studies which have looked at the research on underlining (Anderson and Armbruster, 1984; Nist and Hogrebe, 1987) point out that while underlining is the most popular study aid used by students, there is little evidence to support its effectiveness. Researchers (McAndrew, 1983; Nist and Hogrebe, 1987) cite the von Restorff effect, which says that material isolated against a homogeneous background is more easily recalled than other information. Blanchard (1985) says that the "search and selection" of underlining is intended by students to help them select the most important ideas in a text, but if they are simply underlining without clear-cut goals, it will serve little purpose. McAndrew (1983) says that for underlining to be

effective, students should be taught which material to underline. Specific training in underlining should stress marking of only more important, higher level sentences.

Annotation, as a learning strategy, has great support in theory (Tierney and Pearson, 1984; Wittrock, 1984), but less support in practice. Its usefulness would seem to depend on what Anderson and Armbruster refer to as "depth of processing" (p.670). They point out that mere superficial copying of text probably offers few benefits for students. Guido and Colwell (1987) state that "there needs to be the element of active involvement and restructuring of the text" for learning to be most effective (p. 91). Since the Nist and Simpson (1988) annotation procedure required students to note key ideas in their own words in the margins of their texts, the requirement for summarization and restatement would seem to embody the depth of processing requirement that might be lacking in underlining.

The Study

Subjects

Students involved in the study were enrolled in a seven-week, two-unit study skills course, an elective which they self selected. The study incorporated four classes, two of which were experimental groups, and two of which were control groups. A total of sixty-seven students completed all portions of the study.

Procedures

The two experimental groups were labeled PAR for Preview-Annotation-Recall and PHR for Preview-Highlight-Recall. The two control groups were labeled RRO for Reading and Recall Only and RO for Reading Only. All groups were given pretests to determine whether there were significant differences in prior knowledge. All groups were given two text selections to read on two separate occasions, one selection from a history text and one selection from a science text. All groups were given multiple choice posttests immediately following the reading and all groups wrote delayed recalls of the information three weeks later.

The PAR group was given training in text annotation; the PHR group was given training in underlining. The control groups received no training. The PAR, PHR, and RRO groups wrote recalls of the information in their reading selection immediately following the readings. The RO group did not write recalls.

The training for the two experimental groups was developed with the idea of teaching students to recognize and remember the most important ideas in their texts. Both groups were taught to preview their texts by surveying the material, reading black headings, reading introductions and summaries, and reading the questions, if any, at the end of the material. The PAR group was then taught the Nist and Simpson (1988) method for text annotation. They were to read a paragraph or two, choose the most important information, and summarize it very briefly in their own words in the margins of the text.

The training for the underlining group was based on literature which says that too much underlining tends to be ineffective; that is, selective underlining is more effective because students have to give some attention to choosing the important ideas (McAndrew, 1983). The PHR group was also instructed in previewing the material; students were then told to read the material and to underline or highlight only the one or two most important sentences per paragraph.

The two control groups were given the same reading passages, but were given no training. They were instructed to read the passages with the idea of trying to remember what they had read. They were told that they might process the materials in any way they chose. The RRO group wrote recalls of the material following the readings; the RO group did not.

All groups were given multiple choice tests over the reading selections immediately following the completion of both selections. Three weeks later, all groups were asked to write recalls of both selections.

Materials

In order to determine whether the method of processing made a difference in the comprehension and retention of different types of reading materials, the selections used were taken from a history text and a science text. History and science seemed to present subjects divergent enough to show differences, if in fact differences were present. The text selections were approximately 1000 words long, and were selected from books similar to texts in

use in university classes. Neither of the texts was actually used in classes at the University of Arizona. The text choices were made with the advice of professors of history and chemistry. The history selection dealt with a portion of the industrial revolution; the science selection introduced chemical elements. Students were given fifty minutes to read and process the selection, write answers to a short metacognition questionnaire, and write recalls of the information. All of the students were able to finish in that time, and in fact, very few used all the time available.

Evaluation

Results of the pretests and posttests were analyzed using ANOVAs. The recalls were scored using the Mitchell-Irwin Retelling Profile (1990; see appendix A) and those scores were analyzed by use of t tests. The Mitchell-Irwin Retelling Profile measures four items in each of three domains. The three domains are text-based comprehension, reader response, and language use. In the analysis of the present study, scores were included for only two of the domains, text-based comprehension and language use. There were virtually no reader responses indicated in the recalls, in part, perhaps, because much of that information was solicited on a metacognition questionnaire students completed prior to writing the retellings.

Results

The use of ANOVAs to analyze the multiple choice pretests and posttests indicated no significant differences among the four

groups in prior knowledge or in posttest scores following the readings. However, the t tests used to analyze the scores on the retelling profiles did indicate some significant differences.

On the immediate retellings, (see appendix B), there were no significant differences between the two experimental groups, but the RRO control group scored higher in several areas than did either of the experimental groups. There are two possible explanations for the superior scores of this control group. First, Armbruster and Anderson (1981) have said that there "is some evidence that students who can already study effectively may find training in a new strategy to be more harmful than helpful" (p. 155), and suggest reserving training for those students who do not have effective study techniques. This would suggest that the training given the experimental group may have interfered with effective techniques they were already using.

A second possibility, one suggested by information on the metacognition questionnaires, is that memory training given the RRO group during the week the experimental groups were being trained in annotation and underlining boosted their scores. Notes on the metacognition questionnaires suggest that the RRO students believed that they were being given a test of the memory training, and that they exerted themselves to use the memory techniques to recall the information from the readings. It is also interesting to note that of the eighteen RRO students who completed the recalls, sixteen of them self-selected annotation as a method of processing the material. Two used underlining

only.

Scores for the delayed retellings (appendix C) indicate no significant differences between the two experimental groups except in the area of text comprehension for science. A pilot study run prior to the experimental study showed an even more pronounced difference for this area, leading to a hypothesis that the annotation method allows students studying science to organize the material in science texts in such a way as to enable them to learn it more easily. In the other comparisons, the RRO group showed superior retention to the PAR group except in the domain of text comprehension for science; the RRO group was superior to the PHR group only in language use for science.

The most significant differences among the groups occurred in the comparison to the RO group. Since all three groups writing recalls scored significantly higher than the group which did not write recalls, the indication is that there is a strong connection between writing about reading and retention of information. Writing recalls may indeed provide the depth of processing which is necessary for the long-term recall of information.

Conclusions

Indications of this study suggest that training students in underlining procedures may increase the effectiveness of the use of that study strategy, at least in the short term. For short term learning, strategic underlining would appear to be an effective study technique. For retention, it would appear that

the annotation method, at least for science studies, is more effective.

The organization of this study did not permit the separation of the effects of the experimental procedures from the effects of writing the recalls. It is interesting to note, however, that all of the groups writing the recalls scored significantly higher than the group which did not write recalls. The indication is that the use of writing in connection with reading provides superior retention to the use of reading without any writing. A reading/writing connection may be useful as a learning strategy when retention is a specific goal.

It might also be suggested, based on the outcomes of this study, that there is some value in teaching students new procedures only in those areas in which their study skills seem ineffective. New methods may interfere with students' skills in areas in which they have already mastered an effective process.

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APPENDIX A

RETELLING PROFILE*

Directions: Indicate with a check ( ) the degree to which the reader's retelling reflects the reader's comprehension in terms of the following criteria:

	none	low degree	moderate degree	high degree
1. Retelling includes information directly stated in text.				
2. Retelling includes information inferred directly or indirectly from text.				
3. Retelling includes what is important to remember from the text.				
4. Retelling provides relevant content, concepts, and context.				
5. Retelling indicates reader's attempts to connect background knowledge with text information.				
6. Retelling indicates reader's attempts to make summary statements or generalizations based on the text and apply them to the real world.				
7. Retelling indicates reader's highly individualistic and creative impressions of or reactions to the text.				
8. Retelling indicates reader's affective involvement with the text.				
9. Retelling demonstrates reader's language fluency (use of vocabulary, sentence structure, language conventions, etc.).				
10. Retelling indicates reader's organization or composition abilities.				
11. Retelling demonstrates the reader's sense of audience or purpose.				
12. Retelling indicates reader's control of the mechanics of speaking or writing.				

Interpretation: Items 1-4 indicate reader's text-based comprehension information;
Items 5-8 indicate reader's response and reactions to text;
Items 9-12 indicate reader's language use.

* from Mitchell, J.N. & Irwin, P.A. (1990). The reader retelling profile: Using retellings to make instructional decisions. In preparation.

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Comparison of Immediate Retelling Scores for Annotation (PAR) vs. Underlining (PHR)

	PAR		PHR				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	5.55	2.61	6.15	2.12	-.75	.46	NS
Text Comp Hst	5.95	2.65	5.62	1.89	.44	.66	NS
Lang Use Sci	3.45	2.77	3.38	2.14	.08	.93	NS
Lang Use Hst	4.32	3.39	5.23	2.42	-.93	.36	NS

Comparison of Immediate Retelling Scores for Annotation (PAR) vs. Control with Recall (RRO)

	PAR		RRO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	5.55	2.61	6.94	1.95	-1.93	.061	NS
Text Comp Hst	5.95	2.65	8.00	1.68	-2.97	.0053	S
Lang Use Sci	3.45	2.77	6.28	2.67	-3.27	.0024	S
Lang Use Hst	4.32	3.39	8.17	2.46	-4.16	.0002	S

Comparison of Immediate Retelling Scores for Underlining (PHR) vs. Control with Recall (RRO)

	PHR		RRO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	6.15	2.12	6.94	1.95	-1.06	.30	NS
Text Comp Hst	5.62	1.89	8.00	1.68	-3.62	.004	S
Lang Use Sci	3.38	2.14	6.28	2.67	-3.34	.0024	S
Lang Use Hst	5.23	2.42	8.17	2.46	-3.31	.0027	S

COMPARISON OF SCORES FOR DELAYED RETELLINGS APPENDIX C

Comparison of Delayed Retelling Scores for Annotation (PAR) and Underlining (PHR)

	PAR		PHR				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	3.82	2.15	2.54	1.45	2.10	.044	S
Text Comp Mat	3.00	2.56	3.92	2.43	1.06	.30	NS
Lang Use Sci	1.91	1.97	1.38	1.19	.98	.33	NS
Lang Use Mat	2.77	3.49	3.46	3.23	.59	.56	NS

Comparison of Delayed Recall Scores for Annotation (PAR) and Control with Recall (PHR)

	PAR		RRO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	3.82	2.15	3.33	1.78	.78	.44	NS
Text Comp Mat	3.00	2.56	5.50	2.26	-3.28	.0023	S
Lang Use Sci	1.91	1.97	3.89	2.47	-2.76	.0096	S
Lang Use Mat	2.77	3.49	5.78	3.41	-2.75	.0094	S

Comparison of Delayed Recall Scores for Annotation (PAR) vs. Control without Recall (RO)

	PAR		RO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	3.82	2.15	.929	.730	5.80	.000	S
Text Comp Mat	3.00	2.56	1.43	1.70	2.21	.034	S
Lang Use Sci	1.91	1.97	.143	.535	3.97	.005	S
Lang Use Mat	2.77	3.49	.64	2.13	2.27	.030	S

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Comparison of Delayed Retelling Scores for Underlining (PHR) vs. Control with Recall (RRO)

	PHR		RRO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	2.54	1.45	3.33	1.78	-1.37	.18	NS
Text Comp Hst	3.92	2.43	5.50	2.26	-1.84	.079	NS
Lang Use Sci	1.38	1.19	3.89	2.47	-3.74	.0010	S
Lang Use Hst	3.46	3.23	5.78	3.41	-1.93	.065	NS

Comparison of Delayed Recall Scores for Underlining (PHR) and Control without Recall (RO)

	PHR		RO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	2.54	1.45	.929	.730	-3.60	.0022	S
Text Comp Hst	3.92	2.43	1.43	1.70	-3.07	.0058	S
Lang Use Sci	1.38	1.19	.143	.535	-3.45	.0033	S
Lang Use Hst	3.46	3.23	.64	2.13	-2.65	.015	S

Comparison of Delayed Recall Scores for Control without Recall (RO) and Control with Recall (RRO)

	RO		RRO				
	Mean	SD	Mean	SD	T	P	
Text Comp Sci	.929	.730	3.33	1.78	-5.19	.0000	S
Text Comp Hst	1.43	1.70	5.50	2.26	-5.83	.0000	S
Lang Use Sci	.143	.535	3.89	2.47	-6.25	.0000	S
Lang Use Hst	.64	2.13	5.78	3.41	-5.22	.0000	S